

Listing of Claims:

[Claim 1] (Cancelled).

[Claim 2] (Presently Amended) A method of removing phosphorus from phosphorus containing waste, comprising the steps of: (a) contacting the phosphorus containing waste with a membrane; and (b) precipitating phosphorus from the waste as struvite. A method according to ~~[Claim 1]~~ wherein the ~~non-cellular~~ membrane is negatively charged and is organized as a monolayers, micelles, lamellar bilayers or bilayer vesicles.

[Claim 3] (Presently amended) A method according to **[Claim 2]**~~[Claim 1]~~ wherein the ~~non-cellular~~ membrane is a "self-assembling monolayer" ("SAM").

[Claim 4] (Original) A method according to **[Claim 2]** wherein the SAM is formed through a mercapto-derivatized chalcophilic or siderophilic element compound.

[Claim 5] (Original) A method according to **[Claim 4]** wherein the chalcophilic or siderophilic element is selected from Cu, Ag, Zn, Cd, Ga, In, Tl, Pb, Hg, Bi, Au, Ge, Sn, Ni, Pd and Pt.

[Claim 6] (Original) A method according to **[Claim 4]** wherein the mercapto-derivatized chalcophilic or siderophilic element compound is copper or gold derivatized with mercapto-undecanoic acid, $[\text{HS}(\text{CH}_2)_{10}\text{COOH}]$.

[Claim 7] (Original) A method according to **[Claim 6]** wherein struvite is further nucleated as crystals on copper or gold derivatized with mercapto-undecanoic acid, $[\text{HS}(\text{CH}_2)_{10}\text{COOH}]$.

[Claim 8] (Original) A method according to **[Claim 7]** wherein the struvite crystallization occurs along the 001 plane, and wherein the struvite structure has planes of Ammonium [1], Magnesium [2] and Phosphate [3] stacked in layers of 2-3-1-2-3-orientation.

[Claim 9] (Presently amended) A method according to **[Claim 2]** wherein the monomolecular ~~non-cellular~~ membrane has a hydrophobic tail having an acyl chain of 8-24 carbon lengths, and a hydrophilic head group.

[Claim 10] (Original) A method according to **[Claim 2]** wherein the acyl chain is saturated, unsaturated or esterified.

[Claim 11] (Original) A method according to **[Claim 9]** wherein the head group is selected from the group consisting of sulfonic acid, carboxylate, sulfate, sulfonate, perfluorosulfonate, phosphate, phosphonate and alcohol.

[Claim 12] (Original) A method according to **[Claim 2]** wherein the carboxylic acid is selected from the group consisting stearic acid, stearyl sulfate, stearyl sulfonate, stearyl phosphate, stearyl phosphonate and stearyl alcohol.

[Claim 13] (Cancelled)

[Claim 14] (Presently amended) A method of removing phosphorus from phosphorus containing waste, comprising the steps of: (a) contacting the phosphorus containing waste with a membrane; and (b) precipitating phosphorus from the waste as struvite,

~~A method according to **[Claim 13]**~~ wherein the membrane is a polymeric membrane selected from the group consisting of negatively charged sulfonic acid, carboxylate, sulfate, sulfonate, perfluorosulfonate, phosphate, phosphonate and alcohol, and combinations thereof, embedded in a nylon or acrylic membrane.

[Claim 15] (Presently amended) A method according to **[Claim 2]**~~**[Claim 1]**~~ wherein the phosphorus containing waste has a pH between 7 and 14.

[Claim 16] (Presently amended) A method according to **[Claim 2]**~~**[Claim 1]**~~ wherein the phosphorus containing waste has a pH between 8 and 10.

[Claim 17] (Presently amended) A method according to **[Claim 2]**~~[Claim 4]~~ further comprising the step of adding ferric chloride to the phosphorus containing waste and precipitating phosphorus.

[Claim 18] (Presently amended) A method according to **[Claim 2]**~~[Claim 4]~~ wherein the phosphorus containing waste is selected from the group consisting of biosolids, bioliquids, water bodies, solutions, colloids and precipitates.

[Claim 19] (Cancelled).

[Claim 20] (Presently Amended) An apparatus for removing phosphorus from phosphorus containing waste, comprising:

a first chamber for containing phosphorus containing waste;

a second chamber for containing suitable ionic salts and solutions;

a cation exchange membrane separating the first and second chambers, wherein the membrane is held and sealed between the first and second chambers and An apparatus according to **[Claim 19]** wherein the membrane is a polymeric acrylic membrane containing functional groups selected from the group consisting of sulfonic acid, carboxylate, sulfate, sulfonate, perfluorosulfonate, phosphate, phosphonate and alcohol.

[Claim 21] (Presently Amended) An apparatus according to ~~[Claim 19]~~**[Claim 20]** wherein the second chamber for containing suitable ionic salts and solutions contains suitable ionic salts and solutions are selected from the group consisting of MgCl_2 , MgO , $\text{Mg}(\text{OH})_2$, $\text{Mg}(\text{O}_2\text{CCH}_3)_2$ and MgSO_4 .

[Claim 22] (Presently Amended) An apparatus according to **[Claim 20]** ~~[Claim 19]~~ wherein the first chamber for containing phosphorus containing waste has no freshly added phosphorus containing waste and wherein the second chamber for containing suitable ionic salts and solutions has no freshly added ionic salts and solutions are added.

[Claim 23] (Presently Amended) An apparatus according to [Claim 20] ~~[Claim 19]~~ wherein the first chamber for containing phosphorus containing waste has freshly added phosphorus containing waste and the second chamber for containing suitable ionic salts and solutions has freshly added ionic salts ~~are added~~, optionally as countercurrents, whereby direction of addition of fresh phosphorus containing waste is opposite to the direction of addition of fresh ionic salt and solutions.

[Claim 24] (Presently Amended) An apparatus according to [Claim 20] ~~[Claim 19]~~ wherein fresh phosphorus containing waste and spent ionic salts and solutions are added at one end and substantially struvite stripped phosphorus containing waste and fresh ionic salts and solutions are added at an opposing end, thereby forming a multistage reactor.

[Claim 25] (Original) A method of removing phosphorus from phosphorus containing sewage including filtrate and biosolids comprising the steps of:

- (a) contacting the sewage with a first polymeric membrane reactor and removing phosphorus as primary struvite;
- (b) adding Mg to make the sewage supersaturated with struvite; and
- (c) contacting the sewage with a second monomolecular membrane and removing phosphorus as secondary struvite.

[Claim 26] (Original) A method according to **[Claim 25]** wherein the first polymeric membrane is selected from the group consisting of a negatively charged nylon polymeric membrane and negatively charged acrylic polymeric membrane.

[Claim 27] (Original) A method according to **[Claim 25]** wherein the second monomolecular membrane is selected from the group consisting of stearic acid membrane, stearyl sulfate membrane, stearyl sulfonate membrane, stearyl phosphate membrane, stearyl phosphonate membrane and stearyl alcohol membrane.

[Claim 28] (Original) A method according to **[Claim 25]** wherein the phosphorus containing sewage has a pH between 8-10.

[Claim 29] (Original) A method according to **[Claim 25]** further comprising the step of contacting sewage biosolid with ferric chloride and precipitating phosphorus.

[Claim 30] (Original) A method according to **[Claim 25]** wherein the phosphorus containing sewage has passed through at least a dewatering unit, GBT, GBT Filtrate Well, Centrifuge, or Centrifuge Well prior to removal of phosphorus by said method.

[Claim 31] (Cancelled).

[Claim 32] (Presently amended) A method of removing phosphorus, potassium, ammonium, magnesium, selenium or arsenic from waste containing phosphorus, potassium, ammonium, magnesium, selenium or arsenic, comprising the steps of:

(a) contacting the waste with a membrane; and

(b) precipitating phosphorus, potassium, ammonium, magnesium, selenium or arsenic from the waste as struvite or an analog thereof.

~~A method according to **[Claim 31]** wherein the non-cellular membrane is negatively charged and is organized as monolayers, micelles, lamellar bilayers or bilayer vesicles.~~

[Claim 33] (Presently amended) A method according to [Claim 32]~~**[Claim 31]**~~ wherein the non-cellular membrane is a "self-assembling monolayer" ("SAM").

[Claim 34] (Original) A method according to **[Claim 33]** wherein the SAM is formed through a mercapto-derivatized chalcophilic or siderophilic element compound.

[Claim 35] (Original) A method according to **[Claim 34]** wherein the chalcophilic or siderophilic element is selected from Cu, Ag, Zn, Cd, Ga, In, Tl, Pb, Hg, Bi, Au, Ge, Sn, Ni, Pd and Pt.

[Claim 36] (Presently amended) A method according to [Claim 32]~~**[Claim 31]**~~ wherein struvite analog is $\text{MgKPO}_4 \cdot 6\text{H}_2\text{O}$, $\text{MgNH}_4\text{AsO}_4 \cdot 6\text{H}_2\text{O}$, $\text{MgNH}_4\text{SeO}_4 \cdot 6\text{H}_2\text{O}$, $\text{KMgCl}_3 \cdot 6\text{H}_2\text{O}$, or $\text{K}_2\text{Mg}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$.